

REMARKS/ARGUMENTS

Claims 1-14, 31 and 32 have been canceled without prejudice or disclaimer. Claims 15-30 have been withdrawn. The specification and claim 33 have been amended. New claims 36-39 have been added. Subsequent to the entry of the present amendment, claims 33-39 are pending and at issue. These amendments and additions add no new matter as the claim language is fully supported by the specification and original claims.

I. Election/Restrictions

Applicant affirms the election of Group I, claims 1-14 and 31-35, drawn to a method of analysis of molecules in a chamber. Applicant has responded to a similar Election/Restriction requirement in the parent U.S. Application No. 10/262,349, filed September 30, 2002, and will prosecute claims 1-14 with the parent application. Therefore, Applicant has canceled claims 1-14 in the present application and will prosecute claims 31-35.

II. Objections to the drawings

Part 3 of the Office action states that the drawings are objected to as allegedly failing to represent “the essence of the invention in a clear form.” Applicant is unaware of any statute or case law that specifically requires the Applicant to represent the essence of his/her invention in a drawing in **any** form. According to 37 CFR §1.81(a), the Applicant is only required to “furnish a drawing of his or her invention **where necessary for the understanding of the subject matter sought to be patented** (emphasis added).” It is Applicant’s position that the illustrations provided in the instant application are provided to “facilitate an understanding of the invention” (see 37 CFR §1.81(b)), not because the illustrations are necessary to support the claimed inventions.

With regard to Figure 2, the Office Action alleges that “no inventive features are shown in the Figure.” The Office Action further alleges that Figure 2 should be labeled “Prior Art” so as to identify it as a “well-known scheme in the art.” In parallel with the position stated above,

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Applicant is unaware of any statute that requires a drawing, or any element thereof, to be identified as “prior art,” or “new,” or any combination thereof. Applicant invites the Examiner to clarify this objection. Absent such clarification, Applicant submits that the drawings as currently labeled satisfy the requirements of 37 CFR §1.81.

The Office Action further alleges that the Figures are not clear as to the means by which a single molecule is held in the resonance chamber for analysis. Applicant notes that a single molecule of interest can exist in a flow path (e.g., a microchannel flow path) such that the molecule is present in the resonance chamber (e.g., a resonance chamber or optical microcavity) during analysis by the claimed method. For example, Figure 22 shows a plot comparing the energies of Raman scattered light generated from single molecules respectively contained inside an optical resonance chamber (curves A and B) or positioned in free space without resonance enhancement (curve C) (also see paragraphs [0116]-[0122]). In addition, at paragraph [0106] of the application as filed (paragraph [0112] of the application as published), the specification clearly indicates that single nucleotides can be detected by SERS using microfluidic channels. Paragraph [0106] describes the use of polydimethylsiloxane (PDMS) in the construction of microfluidic channels (Anderson et al. "Fabrication of topologically complex three-dimensional microfluidic systems in PDMS by rapid prototyping," *Anal. Chem.* 72:3158-3164, 2000). While Applicant believes that it is unnecessary for the figures to identify the exact means by which molecule can be “held” in the chamber for analysis, such information is available in the specification.

The Office Action alleges that the “resonance cavity” should be indicated separately in Figure 2. The Office Action further alleges that the specific relationship between the “cavity height and analyte frequencies need to be indicated in the Figure” (see page 4, second paragraph of the pending Office Action). Finally, the Office Action alleges that Figures 5 through 22 “refer to non-elected inventions” and should not be considered in the present Office action (see page 4, paragraph 3 of the pending Office Action). Applicant respectfully disagrees and submits that the present specification and drawings should not be viewed as individual packets of information

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relevant only to specific claims. On the contrary, the present application, and the entire contents thereof (e.g., specification, drawings and claims), should be viewed as an integrated document and examined accordingly. Applicant invites the Examiner to review Figures 5 and 6 which provide support for the structure and function of a resonance chamber of the invention. Applicant submits that drawings which display such devices should not be ignored simply because “device” claims are not currently under examination.

In general, the Examiner appears to require that information contained in the specification be reproduced in the figures. For example, referring to Figure 2, the Office Action alleges that “specific relations between the cavity height and analyte frequencies need to be indicated on the figure.” It is Applicant’s position that this information need not be reiterated in the figures when it is already available in the specification. For example, paragraph [0046] clearly indicates a change in frequency or wavelength of the inelastically scattered radiation is based on the particular characteristics of the sample or molecule of interest. Stated differently, the difference between the frequencies of the input radiation and the inelastically scattered radiation is characteristic of the sample. While the figures may augment the information provided in the specification, the information in the specification need not be reproduced in the figures in order for such figures to be deemed “acceptable” to the Office.

Finally, the Office Action states that it is not clear which embodiments of the invention are related to the information provided in Figure 4. Applicant notes that Figure 4 provides information regarding the Raman spectra of various nucleotides. Applicant further notes that paragraph [0061] of the application as filed (paragraph [0063] of the application as published) provides additional information regarding Figure 4 and the Stokes Raman spectra of the four nucleotides disclosed therein. Paragraph [0048] of the application as filed (paragraph [0050] of the application as published) discusses the impact of these spectra on the design of a resonance chamber of the invention (see, e.g., the last 2 lines of paragraph [0048] at page 16). This information can be used to facilitate an understanding of a variety of embodiments of the inventions disclosed by the specification.

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In view of the above discussion, Applicant requests that the objections to the drawings be withdrawn.

II. Objections to the Specification

The Office Action alleges that the **title** of the application is not descriptive. Applicant has amended the title to be descriptive of the claimed invention.

The Office Action alleges that the **abstract** of the disclosure is unclear as to which “inventive features of the instant application the abstract discloses.” Applicant has amended the abstract to recite features of the claimed invention.

The Office Action requests that “if” be replaced with “of” at page 5, line 6, in the application. Applicant has complied with this request by amending **Paragraph [0032]**.

Applicant requests that the objections to the specification be withdrawn.

III. Objections under 35 U.S.C. §112, First Paragraph

The specification is objected to as allegedly not containing “a written description of the invention and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to practice the method in its best mode.” Applicant notes that the Office Action has failed to identify any claimed subject matter which was not described or enabled by the present specification. In short, absent an actual rejection of clearly identified subject matter (i.e., claims), Applicant is unable to respond to the pending objection. Applicant invites the Examiner to either 1) withdraw the objection or 2) properly identify those claims the Examiner wishes to reject under 35 U.S.C. §112, first paragraph.

IV. Rejections under 35 U.S.C. §112, First Paragraph

A. Claims 1-8 and 31-35 stand rejected under 35 U.S.C. §112, first paragraph, as allegedly containing subject matter not described in the specification in such a way as to enable one of skill in the art to make or use the invention. This rejection is moot with regard to canceled

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claims 1-8, 31 and 32. Applicant respectfully traverses this rejection as it may apply to the amended claims 33-35 and new claim 36-39.

Specifically, the Office Action alleges that the specification fails to provide “the frequency of the particular radiation to be resonated in the chamber.” In response, Applicant has reproduced paragraph [0048] of the application as filed (paragraph [0050] of the application as published) below:

[0047] A chamber may be designed to resonate an inelastically scattered radiation for a molecule of interest (e.g., a particular nucleotide) or set of molecules of interest (e.g., a set of nucleotides). As one example, consider for a moment the Stokes spectra shown in FIG. 4 (which will be discussed in more detail below) generated from excitation with a 514 nanometer argon-ion laser. The bottommost spectra for the molecule deoxythymidine monophosphate has a pronounced peak at a Stokes Raman shift of approximately 1350 cm⁻¹. This shift is offset from the excitation wavenumber of 19455 cm⁻¹ (i.e., 10⁷/514 = 19455) for the 514 nanometer excitation radiation, and translates into an actual Stokes Raman wavenumber of approximately 18105 cm⁻¹ (i.e., 19455-1350). This corresponds to a wavelength of 552 nanometers (i.e., 10⁷/18105). This Stokes scattered radiation may be resonated in the chamber in order to amplify the optical signal and improve detection. The particular reflectors shown in FIG. 2 may be separated by a distance that is approximately one half the product of the mode of the resonance frequency times the speed of light divided by the index of refraction of the medium filling the cavity divided by the frequency of the particular radiation to be resonated in the chamber for this 552 nanometer scattered radiation. As another example, the chamber may be designed to resonate this wavelength of radiation as well as wavelengths of inelastically scattered radiation from other molecules of interest. In one embodiment of the invention, the predetermined distance between the reflectors is a function of wavelengths corresponding to prominent peaks in the Raman spectra of a plurality of molecules of interest (see e.g., the peaks in FIG. 4). The function may be an average, a weighted average, or other combinatorial functions.

An analysis of whether the claims under examination are supported by an enabling disclosure requires a determination of whether the disclosure contains sufficient information regarding the subject matter of the pending claims as to enable one skilled in the pertinent art to make and use the claimed invention. The information regarding “scattered radiation

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frequencies” provided in paragraph [0048] is but one example of the type of information available in the present specification which supports the claimed methods. In view of this information, Applicant submits that the pending claims are fully enabled by the present specification.

The enablement requirement does not require that the specification of an application explicitly teach each and every aspect of a claimed invention. It only requires that the information provided in the specification, coupled with information known in the art, enable one skilled in the art to make or use the claimed invention without undue experimentation. In view of the information provided in the specification, Applicant submits that there is no *reasonable* basis for questioning the enablement of the pending claims. Accordingly, Applicant respectfully requests that this rejection be withdrawn.

B. Claims 9-14 stand rejected under 35 U.S.C. §112, first paragraph, as allegedly containing subject matter not described in the specification in such a way as to enable one of skill in the art to make or use the invention. Applicant notes that these rejections are moot with regard to canceled claims 9-14. Accordingly, Applicant respectfully requests that this rejection be withdrawn.

V. Rejections under 35 U.S.C. § 112, Second Paragraph

Claims 1-14 and 31-35 stand rejected under 35 U.S.C. § 112, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. This rejection is moot with regard to cancelled claims 1-14, 31 and 32. Claims 33-35 now depend on new claim 36. Applicant traverses this rejection as it may apply to the new claim 36.

The Office Action alleges that the specification does not specifically disclose the structure of a “micro-sized resonant spectroscopic analysis chamber.” Applicant notes that new claim 36 recites a “resonance chamber” which is fully supported in the specification at, for

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example, paragraphs [0046] – [0048] in the application as filed (paragraphs [0048] – [0050] in the application as published). . Accordingly, Applicant respectfully requests that the rejection under 35 U.S.C. §112, second paragraph, be withdrawn.

Further, the Office Action alleges that the phrase “irradiating the radiation” in the claims is technically incorrect. Applicant notes the new claim 36 recites “transmitting” the radiation. Support for “transmitting” can be found in the first line of paragraph [0056] of the application as filed (paragraph [0058] of the application as published) which recites, in part, “the scattered radiation may be irradiated or transmitted from the chamber...” . Accordingly, Applicant respectfully requests that the rejection under 35 U.S.C. §112, second paragraph, be withdrawn.

The Office Action appears to take the position that it is unnecessary to measure the wavelength of the inelastically scattered radiation resulting of the targeted molecule if the such a wavelength is already known. Applicant notes that the claimed method encompasses identifying the presence of a targeted molecule in a sample. As noted in paragraph [0044] of the application as filed (paragraph [0046] of the application as published), a change in frequency or wavelength of the inelastically scattered radiation is based on the particular characteristics of the sample or molecule of interest contained therein. That is, the difference between the frequencies of the input radiation and the inelastically scattered radiation is characteristic of the sample. As set forth in paragraph [0048] of the application as filed (paragraph [0050] of the application as published) the resonance chamber may be modified to selectively resonate an inelastically scattered radiation for a molecule of interest (e.g., a particular nucleotide) or set of molecules of interest (e.g., a set of nucleotides). Paragraph [0050] of the application as filed (paragraph [0052] of the application as published) further describes how such modifications may be accomplished. For example, a multi-layer dielectric mirror may contain layers that have a thickness that is proportional to a wavelength of an inelastically scattered radiation for a molecule of interest (e.g., a particular nucleotide) or set of molecules of interest (e.g., a set of nucleotides).

In order to clarify the claimed method, new claim 36 includes the step of “selectively resonating inelastically scattered radiation characteristic of a molecule of interest in the chamber...” In view of the content of the present application as described above, the teachings of the prior art, and the claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made, Applicant submits that the scope of the subject matter embraced by the claims is clear. Accordingly, Applicant respectfully requests that the rejection under 35 U.S.C. §112, second paragraph, be withdrawn.

VI. Rejections under 35 U.S.C. § 102

Claims 1, 2, 6-8, 31 and 32 stand rejected under 35 U.S.C. §102(a) as allegedly anticipated by Maleki et al. Further, claims 1, 2 and 31 stand rejected under 35 U.S.C. §102(b) as allegedly anticipated by any of Graham et al., Xie et al, or Kneipp et al. Applicant notes that these rejections are moot with regard to canceled claims 1, 2, 6-8, 31 and 32. Accordingly, Applicant requests that all rejections under 35 U.S.C. §102 be withdrawn.

VII. Rejections under 35 U.S.C. § 103

A. Claims 3-5 and 34-35 stand rejected under 35 U.S.C. §103(a) as allegedly obvious over Maleki et al in view Graham. This rejection is moot with regard to canceled claims 3-5. Applicant traverses this rejection as it may apply to claims 34-35.

Claims 34-35 ultimately depend from new claim 36. Applicant submits that neither Maleki, nor Graham, or the combination thereof, teaches or suggests selectively resonating inelastically scattered radiation characteristic of a first target molecule in the chamber and transmitting the selectively resonated radiation from the chamber, as currently set forth in new claim 36. Applicant further submits that if an independent claim is nonobvious under 35 U.S.C. §103, then any claim depending therefrom is nonobvious (see MPEP §2143.03). Accordingly, Applicant requests that this rejection under 35 U.S.C. §103(a) be withdrawn.

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B. Claims 1-8 and 31-35 stand rejected under 35 U.S.C. §103(a) as allegedly obvious over Vo-Dinh in view Graham. This rejection is moot with regard to canceled claims 1-8, 31 and 32. Applicant traverses this rejection as it may apply to claims 33-35.

Claims 33-35 ultimately depend from new claim 36. Applicant submits that neither Vo-Dinh, nor Graham, or the combination thereof, teaches or suggests selectively resonating inelastically scattered radiation characteristic of a first target molecule in the chamber and transmitting the selectively resonated radiation from the chamber, as currently set forth in new claim 36. Applicant further submits that if an independent claim is nonobvious under 35 U.S.C. §103, then any claim depending therefrom is nonobvious (see MPEP §2143.03). Accordingly, Applicant requests that this rejection under 35 U.S.C. §103(a) be withdrawn.

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VIII. Conclusion

In view of the amendments and above remarks, it is submitted that the claims are in condition for allowance, and a notice to that effect is respectfully requested. The Examiner is invited to contact Applicant's undersigned representative if there are any questions relating to this application.

Applicants enclose a check in the amount of \$1020.00 for the additional three-month extension fee associated with this submission. Applicants do not believe any other fees are due in connection with this submission, however if any other fees are due, please charge any fees, or make any credits, to Deposit Account No. 07-1896.

Respectfully submitted,



Dated: May 20, 2005

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